A Statistical Review of the Trend of Infant Mortality in Northern Ireland during the period 1922 to 1947

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INTRODUCTION

IT has been stated that, by means of the infant mortality rate, "the stage of evolution reached by any given population can be measured; it is a measure of people's progress" (Crew, 1948). This implies an association between the infant mortality rate, on the one hand, and social and environmental conditions and medical care of infants on the other. As Martin (1949) reminds us, there are a great number of factors known to affect infant mortality, and, although these are very much interrelated, he suggests that they can be classified broadly as "(1) conditions which affect the whole population; and (2) conditions specific to infancy."

A voluminous literature exists on the subject of the relationship between infant mortality and the two groups of factors categorised above. As far as is known, with the exception of the work of Deeny and Murdock (1943 a and b) on infant mortality in Belfast, no attempt has been made to consider the trend of infant mortality in Northern Ireland from these aspects.

The present paper is an attempt to review various aspects of the trend of infant mortality over the past twenty-six years, using the available published statistics (Registrar General for Northern Ireland, Annual Reports 1922-1947). It is hoped at a later date, when more up-to-date information is available about the living conditions of the population, to examine this mortality trend in relation to the ascertainable changes which have occurred in environmental factors, such as has been done elsewhere.

TREND OF INFANT MORTALITY, 1922-1947

It is appropriate that the trend of infant mortality in the Province should be compared with that observed elsewhere in the United Kingdom. Between the years 1922 and 1947 the rate in Northern Ireland has fallen by 31 per cent. of its initial level—a decline from 77 to 53 deaths of infants under one year of age per one thousand live births. Both in England and Wales and in Scotland the relative decline in the corresponding period has been somewhat greater, and is of the order of 55 and 45 per cent. respectively. In England and Wales the rate in 1922 was the same as that in Northern Ireland (77 deaths per one thousand live births), but by 1947 the English rate had fallen to 42 per one thousand, which is less than that for Northern Ireland by 11 deaths per one thousand live births. In Scotland

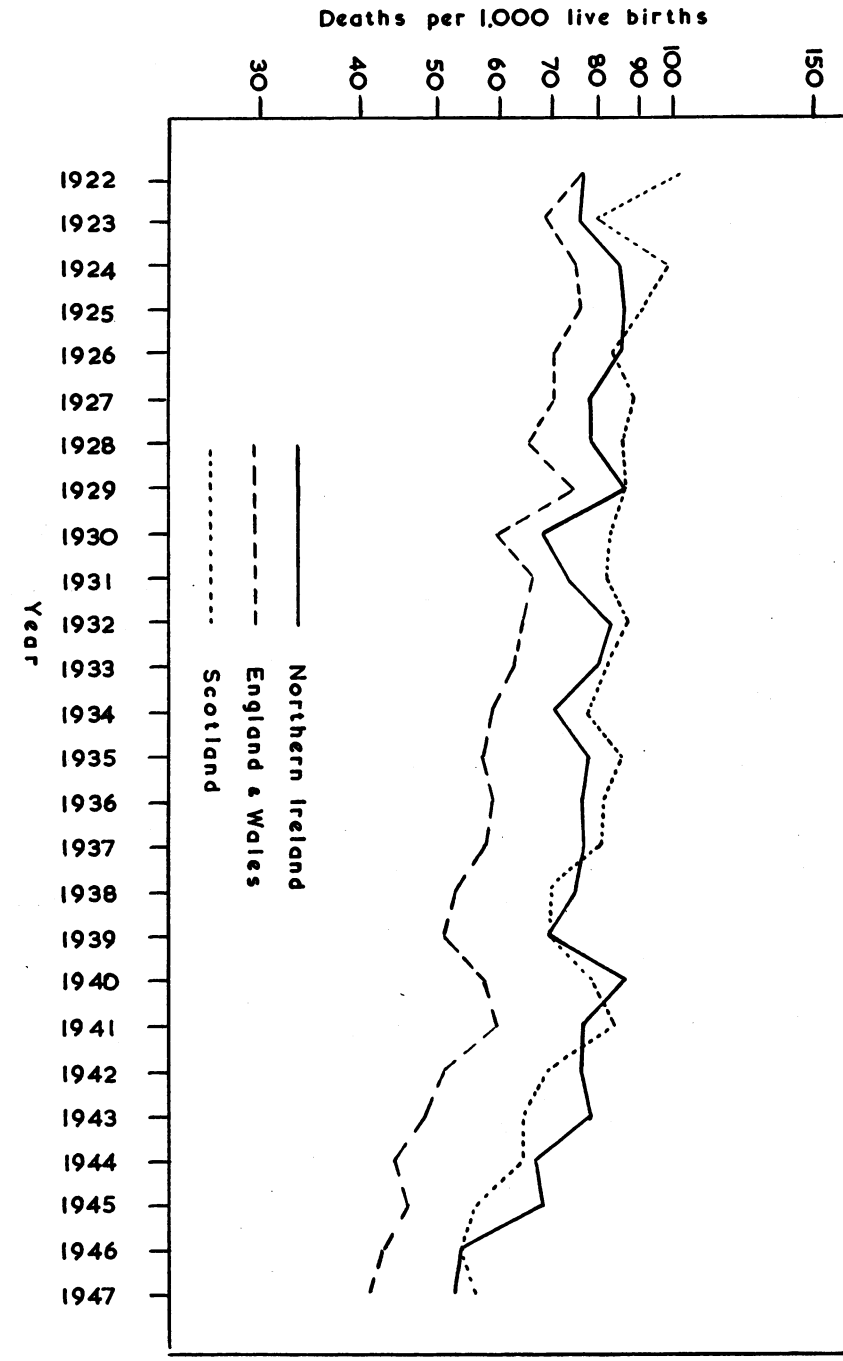

Fig.I Infant mortality rates in Northern Ireland, England & Wales and Scotland

the mortality level in 1922 was considerably higher than it was in either of the other two countries—101 compared with 77 deaths per one thousand live births—but a rapid fall in mortality resulted in the rate approximating closely to that of Northern Ireland by 1947 (56 compared with 53 deaths per one thousand live births).

The comparison of trends in terms of the first and last rates over a period of twenty-six years might be misleading. Consequently, figure I has been prepared to show the annual rates for each country. The mortality rates have been plotted on a logarithmic scale, which permits a direct comparison of the relative changes in the rates—by comparing the slopes of the lines, while preserving the comparison of the absolute levels of the rates—by the position of the plotted points on the lines in relation to each other.

The graph for Northern Ireland presents a somewhat different picture from those for the remainder of the United Kingdom. In England and Wales the general trend of the rate has been steadily downward over the whole period—in point of fact, the rate has been declining exponentially since the beginning of the century in that country (Martin, 1949). In Scotland the general trend has been similar to that south of the border, with possibly less annual fluctuation, although the absolute level of the rate has generally been higher. In contrast, the decline in infant mortality in Northern Ireland has not been apparent throughout the whole of the twenty-six years.

Evidence of a definitely declining infant mortality rate is not easily found in the Northern Ireland experience until as late a date as 1940. The words of the Registrar General for Northern Ireland (1948) adequately sum up the trend in the period under review, although he is inclined to fix the onset of declining mortality somewhat earlier :

"These rates in Northern Ireland averaged 79 per one thousand live births between the years 1922-1935. Wide fluctuations were, however, experienced during this period, the peaks being mainly due to small epidemics in certain diseases, e.g., enteritis and measles. Peak figures were recorded with a rate of 86 in each of the years 1925, 1929, and 1935, representing 2,391, 2,174, and 2,136 deaths per annum respectively. Since 1936 the downward trend has been continuous, except for a break in 1940 caused by increases in various diseases, mainly diarrhœa and enteritis, which resulted in a rate of 86 being returned in 1940, as compared with 70 in 1939." In fact, the rate did not fall below its 1939 level for another four years, when, in 1944, a mortality of 67 deaths per one thousand live births was recorded, as compared with 78 in the preceding year. Over the years 1945, 1946, and 1947, a striking fall in mortality amongst infants has occurred—the rates reported were chronologically 68, 54, and 53 deaths per one thousand live births. In other words, the infant mortality rate fell almost continuously between 1943 and 1947 by as much as 32 per cent. of its 1943 level.

It is reasonable to conclude that, unlike the experience in the rest of the United Kingdom, in Northern Ireland the decline in infant mortality is a comparatively

recent phenomenon. Between 1943 and 1947 the rate at which mortality has fallen in the Province was considerably faster than that in the same period, or for that matter in any period of equal length, during the past twenty-six years, in either England and Wales or Scotland. With a level of 53 deaths per one thousand live births in Northern Ireland in 1947, there would appear to be scope for still further reduction when it is considered that levels as low as 23 and 21 deaths per one thousand live births have been reported from New Zealand and Holland (Joint Committee of the Royal College of Obstetricians and Gynæcologists and the Pædiatric Association, 1949).

Infant Mortality and Age at Death

The Registrar General for England and Wales (1947) drew attention to the fact that after the first week of life, at all age periods examined, mortality of infants declined in that country between the quinquennial periods 1906-10 and 1931-35. However, the decline in infant mortality, wherever observed, has not been uniform at all age periods in the first year of life. For example, if the rates at various age periods in England and Wales for 1939 are expressed as percentages of the corresponding rates in the five-year period 1906-10, the differential rate of decline is clearly demonstrated by the variation of these percentages between age groups :—

England and Wales

Infant Mortality rates in 1939 as percentages of the corresponding rates in the period 1906-10

Age Period	Percentages		
0—1 day	89	86	
1—7 days	84		
1—2 weeks	53		70
2—3 weeks	39		
3—4 weeks	41		
1—3 months	35		
3—6 months	32		
6—9 months	25		
9—12 months	20		

Except for a slight interruption in the fourth week of life, the relative decrease in mortality increased with increasing age at death. Such results are substantiated by the more mathematical approach by Martin (1949), who showed that the average annual rate of decline in mortality during the period 1906-45 was 0.44 per cent. in the first day of life, 0.63 per cent. in the age period one to seven days, and that at later age periods the average annual rate of decline was never less than 2.40 per cent., increasing from this figure in the age period one to four weeks to 4.47 per cent. in the period nine to twelve months.

Sutherland (1946) has mentioned that the comparatively slow decrease of neonatal mortality (deaths in the first four weeks of life per one thousand live births)

is closely allied to the stillbirth rate, while, on the other hand, " . . . it is well recognised that mortality at ages three to twelve months is closely associated with bad environmental conditions." He stressed that neither neo-natal mortality nor the stillbirth rate gave such high correlation with environmental indices, as did mortality in the last nine months of the first year of life. Earlier, Martin, Russell and I (1939) commented upon the increasing part played by environmental conditions on the mortality of young children as age increases. From the English data which we used, it appeared that better chances of survival in infancy occurred in that period of infant life which was most susceptible to environmental improvement. In view of these pronouncements it is of interest to observe the comparative decline at different age periods of infant mortality in Northern Ireland.

Data are available in the annual reports of the Registrar General for Northern Ireland for such an examination over the whole period 1922-47. The results are summarised in Table I. Before 1929 neo-natal deaths were not sub-divided into smaller age periods in the official reports; consequently, the trends of rates for these young age groups can only be shown from 1930 onwards. Comparison of rates in small age groups, or small areas, is complicated by the occurrence of occasional fluctuations from the general trends and by occasional abnormally high annual levels of some rates. For the purpose of this review, such irregularities or abnormalities are not of primary interest, and the trends have been "smoothed" by presenting the rates in Table I in thirteen two-year periods, 1922-23 to 1946-47. To facilitate the comparison of relative changes in the rates at different age periods, the absolute rates have been supplemented by expressing them as percentages of the corresponding rate in the period 1930-31. The latter is the first two-year period for which rates are available for all the age periods tabulated.

Before studying the detail of Table I, the general description of the differential age influence can be seen from figure II. Here the relative changes in neo-natal mortality and post-natal mortality (deaths in the last eleven months of the first year of life per one thousand live births) are shown side by side with the total infant mortality experience.

The trend of post-natal mortality has been closely parallel to that of total infant mortality; the trend of neo-natal mortality, on the other hand, is rather different. Post-natal mortality declined from 46.0 to 28.3 deaths per one thousand live births between 1922-23 and 1946-47, and throughout the twenty-six years the decline has been fairly continuous, although some minor fluctuations occurred. Neo-natal mortality was generally increasing until 1942-43, although the increase was comparatively slight—from 30.8 to 37.1 deaths per one thousand live births. Since 1942-43 neo-natal, like post-natal mortality, has been falling; in each the rate of fall has been approximately the same. It is concluded that that part of infant mortality, which has elsewhere been shown to be most closely associated with environmental conditions, has fallen over the whole twenty-six years, whereas the decline in neo-natal mortality, shown elsewhere to be associated with the stillbirth rate, is of more recent inception. In view of this, it would be interesting

TABLE I

NORTHERN IRELAND—INFANT MORTALITY BY AGE, 1922-47

PERIOD	AGE AT DEATH							TOTAL
	Under 1 day	1-7 days	1-4 weeks	1-months	2-months	3-months	6-months	
	DEATHS PER 1,000 LIVE BIRTHS							
1922-23		30.8		9.3	5.8	12.6	18.3	76.8
1924-25		31.6		9.2	6.4	14.7	23.6	85.5
1926-27		32.2		9.2	6.5	12.5	21.0	81.4
1928-29		30.5		8.8	5.8	13.8	22.7	81.7
1930-31	9.7	10.5	11.0	6.4	4.8	11.9	16.3	70.6
1932-33	10.6	12.0	12.1	8.7	5.3	13.9	18.8	81.4
1934-35	11.9	11.4	10.9	7.9	5.2	13.4	17.0	77.9
1936-37	11.7	12.2	12.1	7.9	6.5	12.8	14.0	77.2
1938-39	11.3	12.4	9.6	7.2	5.7	12.1	14.6	72.9
1940-41	10.7	11.7	11.8	9.5	6.9	14.9	15.6	81.1
1942-43	9.1	12.5	15.5	8.4	6.7	13.7	11.4	77.3
1944-45	10.1	11.4	12.5	7.9	4.9	11.5	9.5	67.7
1946-47	9.6	9.7	5.8	5.6	4.8	9.9	8.0	53.5
	RATES IN EACH PERIOD EXPRESSED AS PERCENTAGES OF THE CORRESPONDING RATES IN PERIOD 1930-31							
1922-23				145	121	106	112	109
1924-25				144	133	124	145	121
1926-27				144	135	105	129	115
1928-29				138	121	116	139	116
1930-31	100	100	100	100	100	100	100	100
1932-33	109	114	110	136	110	117	115	115
1934-35	123	109	99	123	108	113	104	110
1936-37	120	116	110	123	135	108	86	109
1938-39	117	118	87	112	119	102	90	103
1940-41	110	111	107	148	143	125	96	115
1942-43	93	119	141	131	140	115	70	109
1944-45	104	109	114	123	102	97	58	96
1946-47	99	92	53	92	100	83	49	76

to speculate upon the trend of the stillbirth rate in Northern Ireland—unfortunately stillbirths are not registered in the Province.

Returning to Table I, the decrease in neo-natal mortality since 1942-43 has not been uniform throughout the first four weeks of life. The recorded improvement in neo-natal mortality since the period 1942-43 was, in fact, largely due to an improvement in the rates for the second, third, and fourth weeks of life only. For example, between 1944-45 and 1946-47, mortality in that age period fell from

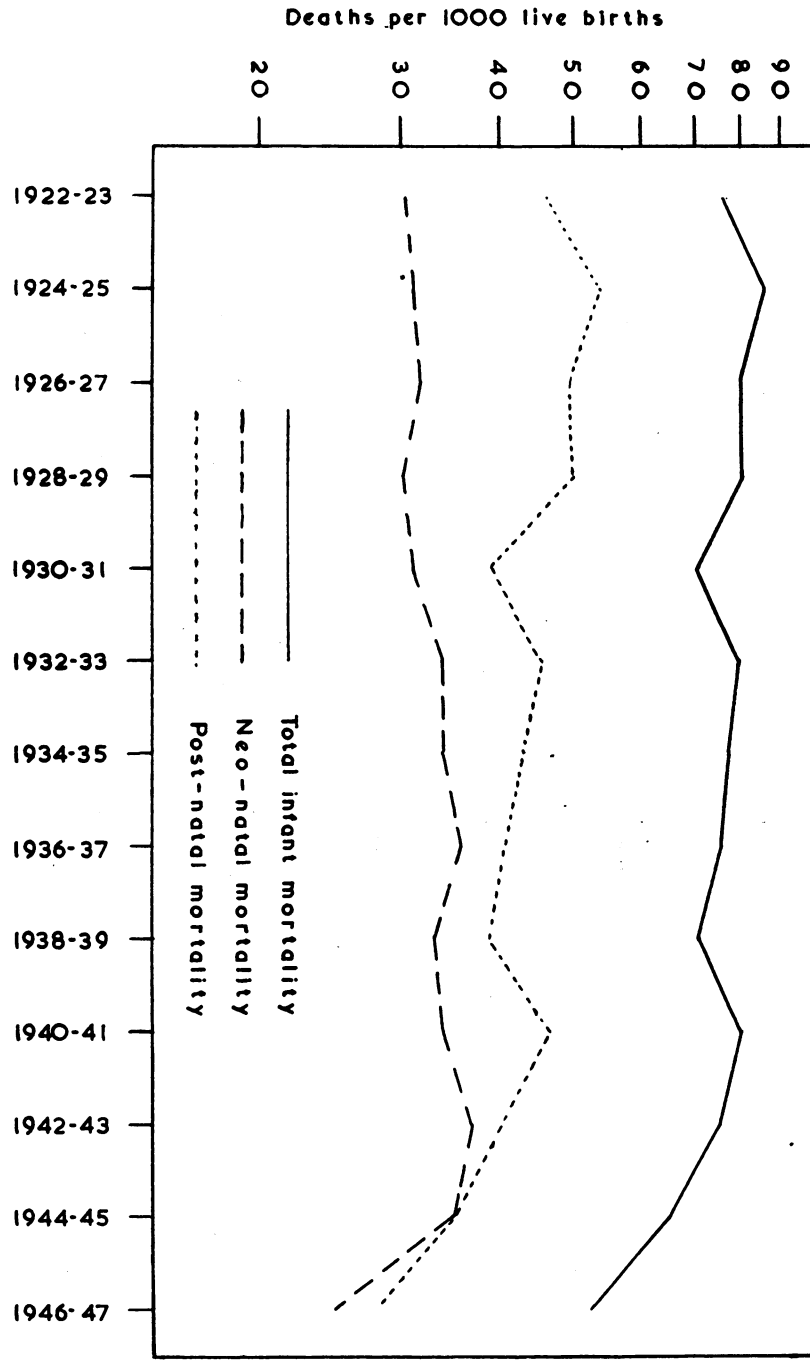

Fig.II Northern Ireland neo-natal and post-natal mortality 1922-47

114 per cent. of its 1930-31 level to 53 per cent. of the same level. In contrast, in terms of the 1930-31 level, mortality in the first day of life fell from 104 to 99 per cent., and in the remainder of the first week from 109 to 92 per cent. In other words, mortality during the first week of life is only slightly less now than it was almost twenty years ago, whereas in the remainder of the neo-natal period mortality has fallen by about 50 per cent.

One might be tempted, from the figures in the table, to over-emphasize the decline in mortality in the one to four weeks age period, by arguing that in 1942-43 the mortality was as high as 141 per cent. of its 1930-31 level, and that during the subsequent six years it fell to 53 per cent. of that level. However, the rates shown for the period 1942-43 are somewhat abnormal in this age group (and possibly in the age groups covering the second and third months of life), since in 1943 there was an unusually heavy mortality from diarrhœa and enteritis among children of these ages.

The steady decline in post-natal mortality over the twenty-six years is largely due to the very striking reduction in mortality which took place in the second six months of life. Since 1936-37 the rate in this age period has never exceeded that recorded for the period 1930-31 and the decline has been continuous since 1940-41. The decline in mortality in the other tabulated age periods after the first month of life has also been fairly continuous since 1940-41, and it is interesting to compare the relative decline in those separate age periods since that date :—

NORTHERN IRELAND

Infant mortality in 1946-47 as a percentage of the corresponding rate in 1940-41

Age Period	Percentage
1—2 months	59
2—3 months	70
3—6 months	66
6—12 months	51

Thus, although in terms of the total infant mortality it would appear that mortality began to decline fairly recently in Northern Ireland, an analysis of the trends of infant mortality in smaller age groups suggests that this late onset of decline has arisen because neo-natal and post-natal mortality tended to balance each other until about 1940. Thus, although the latter has been falling for some time (particularly in the age group six to twelve months), neo-natal mortality (particularly in the first week of life) has been slowly increasing until the early forties; subsequently, both component rates have been falling, with the resultant dramatic decline in the total infant mortality rate of the Province since the beginning of the present decade.

INFANT MORTALITY AND TYPE OF DISTRICT

As may be expected, large regional differences occur in the infant mortality levels within countries composed of many contrasting environments—a situation which arises in part from the association already mentioned between environment

and mortality in the post-natal period. Thus the average infant mortality rates in England and Wales in the periods 1939-41 and 1945-46 for different types of districts were :—

ENGLAND AND WALES

Infant mortality by type of district

Type of District	Deaths under one year per 1,000 live births 1939-41	1945-46
Greater London - - - - - -	43.8 ...	35.9
Aggregate of County Boroughs outside Greater London -	64.6 ...	51.1
Aggregate of Urban Districts outside Greater London -	54.6 ...	43.2
Aggregate of Rural Districts - - - -	50.9 ...	39.1
All Areas - - - - - - -	55.2 ...	43.6

Excluding Greater London, mortality was at a minimum in rural areas and at a maximum in county boroughs, which is highly suggestive of an adverse effect on mortality by increased urbanisation—a suggestion which is compatible with observation, since the density of population in town life has been shown to be associated with high post-natal mortality. The low mortality levels reported for Greater London are interesting, and on this subject the Registrar General for England and Wales (1947) wrote :—"The remarkable fall in the Greater London rates at ages between one and twelve months which occurred in 1939 may have been helped to some extent by selective evacuation of delicate infants in the latter part of the year and the special measures for the care of all infants during that period." However, for many years previously, the rates recorded for London compared very favourably with those elsewhere in England and Wales.

It has been estimated that the average annual rate of decrease in infant mortality in rural districts of England and Wales during the present century was of the order of 2.26 per cent. (Martin, 1949), whereas mortality in the aggregate of the county boroughs, London, and the aggregate of the urban districts all declined more rapidly; the average rates of decline in each case were very similar —2.44, 2.47, and 2.49 per cent. respectively. Approximately half the population of Northern Ireland live in rural areas (47.1 per cent. at the 1937 Census of Population [Registrar General for Northern Ireland, 1947]), and it is, therefore, interesting to trace the pattern of infant mortality in the Province in different types of districts.

The infant mortality rates for the County Borough of Belfast, the aggregate of other urban districts, and the aggregate of rural districts are shown in Table II for twelve two-year periods, 1924-25 to 1946-47. Unfortunately, sub-division by this classification is not possible from the published figures of the years 1922 and 1923. Londonderry County Borough has been combined with the aggregate of "other urban districts" in this analysis, since its size is more comparable with that of a large municipal borough than with Belfast, where approximately a third of the total population of the Province reside (Registrar General for Northern Ireland, 1947). The results of the analysis are shown diagramatically in figure III.

TABLE II

NORTHERN IRELAND—INFANT MORTALITY BY TYPE OF DISTRICT, 1924-47

PERIOD	DEATHS AT AGES UNDER ONE YEAR PER 1,000 LIVE BIRTHS			RATES IN EACH PERIOD EXPRESSED AS PERCENTAGES OF THE CORRESPONDING RATES IN THE PERIOD 1930-31		
	Belfast County Borough	Aggregate of Other Urban Districts	Aggregate of Rural Districts	Belfast County Borough	Aggregate of Other Urban Districts	Aggregate of Rural Districts
1924-25	104.9	95.1	65.3	124	131	113
1926-27	105.3	81.3	62.0	125	112	107
1928-29	105.9	82.9	61.9	125	114	107
1930-31	84.6	72.7	57.9	100	100	100
1932-33	105.4	79.5	63.2	125	109	109
1934-35	96.2	82.9	60.6	114	114	105
1936-37	97.5	72.3	62.8	115	100	108
1938-39	90.7	71.3	59.2	107	98	102
1940-41	106.7	78.8	64.2	126	108	111
1942-43	101.8	74.6	60.8	120	103	105
1944-45	86.4	65.0	55.0	102	89	95
1946-47	60.6	53.6	48.2	72	74	83

As in England and Wales, the urban areas had consistently higher infant mortality rates than the rural areas. The rates recorded for the County Borough of Belfast were at a maximum throughout the whole twenty-four-year period. All three types of area experienced the remarkable decline in mortality which has occurred during the present decade. This decrease has been relatively greatest in Belfast and least in the rural districts. In the period 1940-41 the rate for Belfast was as high as 126 per cent. of its 1930-31 level, but by 1946-47 the rate had fallen to a level equivalent to only 72 per cent. of that in 1930-31. At the other end of the scale, in the period 1940-41, the rural rate was only 111 per cent., and by 1946-47 had only fallen to 83 per cent. of its 1930-31 level.

In general, it appears that the rural rates have varied only slightly over the whole period compared with the much wider fluctuations observed in urban areas, and the more rapid decline of the urban rates, compared with the rural rates, follows the experience observed in England and Wales.

INFANT MORTALITY AND CAUSE OF DEATH

A classification of mortality by cause of death presents several difficulties, but at no age period is the problem so complex as it is in early infancy. Even when post-mortem examination has been performed, the complexity of infant pathology still makes the diagnosis of cause of death uncertain in some instances. Since the majority of assessments are based, not upon autopsy findings, but upon clinical

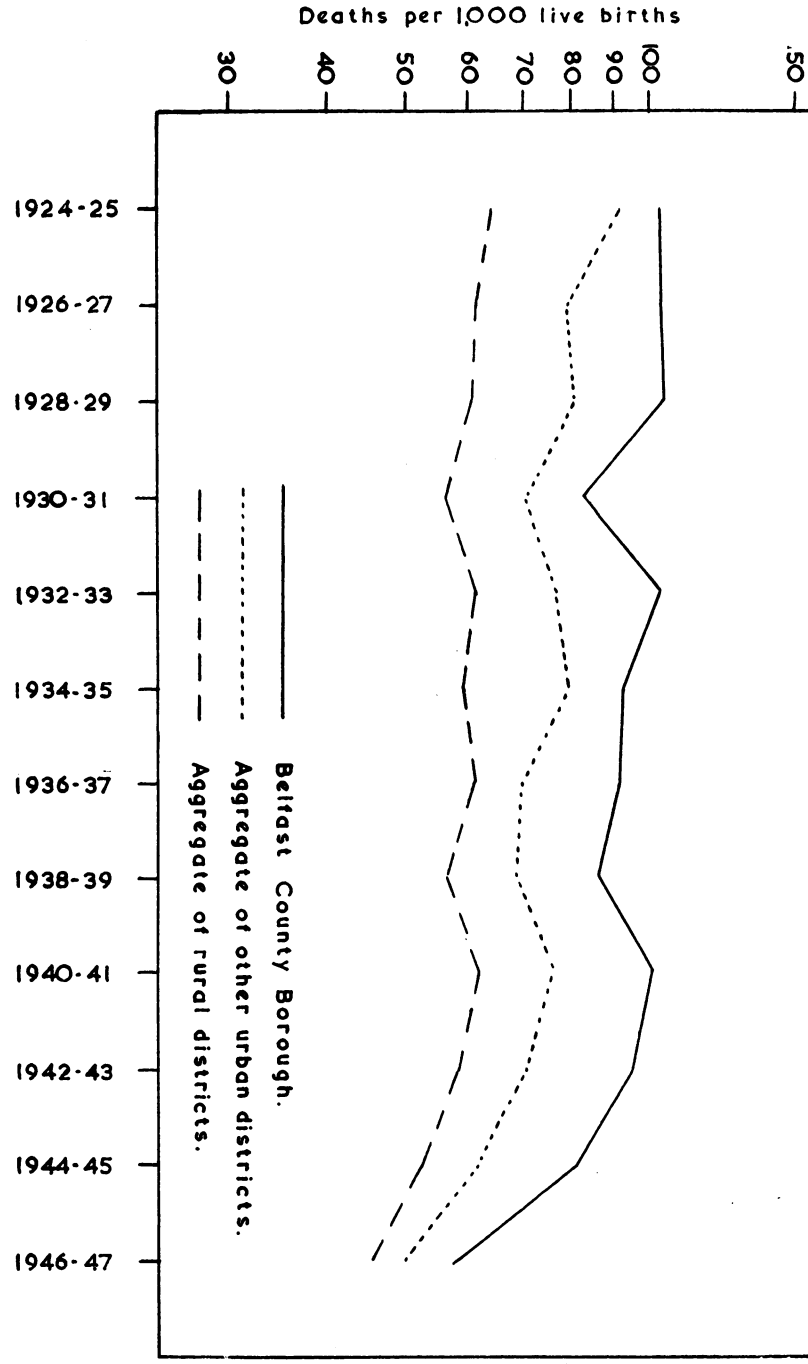

Fig. III Northern Ireland Infant mortality by types of area.

examination, it follows that the allocation of a death to a specific cause group is frequently difficult. Primarily, it is the decisions of pathologists and physicians which form the crude data for any statistical analysis of the mass aspects of mortality in terms of cause of death; any attempt to trace the trend of mortality from one specific cause over a long period is thus bound to be confused by changes in medical knowledge, practice, and skill during the period of review.

In addition to these difficulties, a further complication arises from administrative changes in the methods of allocating and classifying causes of death, as certified on death certificates, to cause groups for official publication. Between 1922 and 1947 two revisions were made in the "International List of Causes of Death." Probably the most important effect of these in relation to the present study is that, with effect from 1940, it was agreed, with minor exceptions, to adopt the certifying practitioner's choice of cause of death for the purpose of allocating deaths to cause groups in the returns of the Registrar General for Northern Ireland. Hitherto, a definite set of rules of procedure had been in use for the selection of one tabulated cause of death from the several causes entered on the medical certificate.

It is to be expected, therefore, that over the whole period of the present review, 1922-47, the mortality rates obtained from the official figures for any one cause of death may not always be strictly comparable from year to year. Thus, deaths which some years ago might have been allocated to one cause of death group will now be attributed to another, either because of more precise diagnosis, or because of a change in the method of selecting the "principal cause" of death in the Registrar General's Department. In spite of this, an examination of the trends of mortality from the more important causes of death amongst infants has been made, but only tentative conclusions have been drawn. Table III shows the appropriate infant mortality rates and the comparative percentages as before.

At the beginning of the period, numerically the most important registered cause of death was "congenital debility." The rate attributed to this "cause" has declined rapidly and continuously, so that in 1946-47 the rate was only 33 per cent. of that in 1930-31. This decline is almost certainly due to the improvement in certification over the past twenty-six years and reflects the gradual elimination of such general descriptions from infant death certificates. As a consequence, the mortality rates obtained for other cause groups include, to a relatively increasing degree, the deaths which would earlier have been described as "congenital debility."

Of the remaining tabulated causes of death, mortality at the end of the period was generally lower than at the beginning in the case of measles, whooping cough, all forms of tuberculosis, bronchitis, and diseases of the nervous system. Possibly in the case of measles, and more certainly in the case of bronchitis and diseases of the nervous system, the fall in mortality has been fairly continuous over the whole period. The fall in bronchitis mortality, from about 5 or 6 per thousand to about 1 per thousand, probably overstates the actual decline. The distinction

TABLE III

Period	Cause of Death					
	Premature Birth and Injury at Birth	Congenital Malformations	Congenital Debility	Diseases of the Nervous System	Violence	Measles
					Deaths under One Year	
1922-23	11.0	2.9	19.0	5.2	0.7	1.1
1924-25	11.9	3.2	20.7	5.4	0.7	1.8
1926-27	12.9	3.8	17.5	5.1	0.7	1.4
1928-29	13.7	3.9	16.2	5.0	0.4	1.9
1930-31	13.5	4.7	13.4	5.5	0.9	1.4
1932-33	16.4	3.9	14.0	5.1	1.1	1.0
1934-35	17.6	5.5	11.6	4.8	1.5	2.8
1936-37	19.4	5.8	11.3	4.1	1.1	0.2
1938-39	16.8	6.7	10.0	4.5	1.3	1.8
1940-41	18.7	6.9	11.2	3.7	1.5	1.1
1942-43	18.4	7.1	10.0	3.8	1.1	0.5
1944-45	16.6	6.2	6.8	3.1	1.0	0.3
1946-47	14.0	5.2	4.4	2.0	0.8	0.3
			Rates in each Period expressed as a Percentage			
1922-23	81	62	142	95	78	79
1924-25	88	68	154	98	78	129
1926-27	96	81	131	93	78	100
1928-29	101	83	121	91	44	136
1930-31	100	100	100	100	100	100
1932-33	121	83	104	93	122	71
1934-35	130	117	87	87	167	200
1936-37	144	123	84	75	122	14
1938-39	124	143	75	82	144	129
1940-41	139	147	84	67	167	79
1942-43	136	151	75	69	122	36
1944-45	123	132	51	56	111	21
1946-47	104	111	33	36	89	21

between bronchitis and pneumonia in young infants is not always easily made, and from the aspect of this study it is probably more reasonable to regard bronchitis and pneumonia as one complete cause of death group. If this is done, the result is again a decline in mortality, but one which is by no means regular over the period and by no means so great. From the two diseases combined, a rate of 17.1 deaths per one thousand live births was observed as recently as 1942-43, and this level was only exceeded once, in 1928-29, in the period reviewed. Ignoring these abnormalities, the impression remains that mortality from "pneumonia and

NORTHERN IRELAND—INFANT MORTALITY BY REGISTERED CAUSE OF DEATH, 1922-47

CAUSE OF DEATH						
Whooping-Cough	Diarrhœa and Enteritis	Tuberculosis all Forms	Bronchitis	Pneumonia	Other Causes	Total
PER 1,000 LIVE BIRTHS						
4.2	7.2	1.5	4.8	9.4	9.7	76.8
4.8	9.3	1.7	6.0	11.1	8.8	85.5
3.1	12.3	1.6	4.7	10.0	8.4	81.4
3.8	8.9	1.3	5.4	12.2	8.9	81.7
2.4	7.2	1.3	3.3	8.9	8.0	70.6
4.1	10.7	1.3	3.0	12.0	8.7	81.4
1.8	9.9	1.1	2.9	10.1	8.3	77.9
3.1	10.2	0.8	2.4	9.7	9.1	77.2
1.9	8.7	0.9	2.1	9.5	8.6	72.9
2.5	12.5	1.3	2.5	9.8	9.3	81.1
1.8	11.0	1.4	5.1	12.0	8.2	77.3
1.8	9.9	1.2	0.9	10.4	9.7	67.7
1.7	6.2	0.9	0.8	9.6	7.5	53.5
OF THOSE IN THE PERIOD 1930-31						
175	100	115	145	106	121	109
200	129	131	182	125	110	121
129	171	123	142	112	105	115
158	124	100	164	137	111	116
100	100	100	100	100	100	100
171	149	100	91	135	109	115
75	138	85	88	113	104	110
129	142	62	73	109	114	109
79	121	69	64	107	108	103
104	174	100	76	110	116	115
75	153	108	64	135	103	109
75	138	92	27	117	121	96
71	86	69	24	108	94	76

bronchitis" has fallen from about 14 or 15 deaths per thousand in the early twenties, to about 10 or 11 per thousand at the present time.

Although the mortality rates for violence and diarrhœa and enteritis were lower in 1946-47 than at the beginning of the reviewed period, the decrease is of recent onset. In the last two decades a rate lower than that in 1930-31 was not recorded until 1946-47. Mortality from violence between 1922 and 1927 was fairly constant, but, after a slight fall in the fourth period, the rate fluctuated between 0.9 and 1.5 deaths per one thousand live births until 1944-45. Diarrhœa and enteritis never

fell below 6 deaths per one thousand live births, while in five of the two-year periods a rate of more than 10 per thousand was reported.

The trend of mortality ascribed to premature birth and injury is of considerable interest in its relation to neo-natal mortality. In the period 1922-23 the mortality rate from these two causes combined was 11.0 deaths per one thousand live births; twenty-five years later it was 14.0 per one thousand. In the intervening period the rate increased to a maximum of 19.4 deaths per one thousand live births in 1936-37, and during the next four two-year periods it fluctuated between 16.6 and 18.7 per thousand. Like the neo-natal mortality rate from all causes, mortality from premature birth and injury at birth combined has been declining since 1940-41. Part of this decline may be due to an overstatement of the prematurity mortality rate prior to 1940. Before that year "premature birth" occupied a fairly high position in the order of preference for selecting the published cause of death from certificates, whereas after 1940 the certifier's preference of principal cause of death was normally accepted.

Mortality attributed to congenital malformations presents a somewhat similar picture to that of premature birth and injury at birth, and, although the mortality is of less absolute importance, the relative trend of mortality from this cause has varied more strikingly. Congenital malformations were responsible for a mortality rate of 2.9 deaths per one thousand live births in 1922-23, but the rate increased fairly steadily until 1942-43, when a mortality of 7.1 deaths per one thousand live births was recorded—a level nearly two and a half times as great as the initial rate. Since 1942-43 there has been a slow fall in mortality registered as due to congenital malformations, and the rate in the last period was 5.2 deaths per one thousand live births—a level rather less than twice what it was twenty-five years ago.

In spite of the difficulties of making an adequate comparison over so long a period already mentioned, it is felt that these trends do present some interesting facts, and that they are not at variance with the results which would be expected from the more certain analysis by age.

Summary

1. A statistical examination has been made of the published data concerning the trend of infant mortality in Northern Ireland during the twenty-six years 1922 to 1947.
2. Infant mortality in Northern Ireland started to decline rapidly at the beginning of the present decade, having been fairly constant between the years 1922 to 1940. It this respect, the trend of mortality differs from that observed in the rest of the United Kingdom, where the rate has been falling over the whole period under review.
3. The trend of infant mortality in the Province has not been uniform at all periods of the first year of life. Mortality in the last six months of the first year of life in particular, and, as a result, post-natal mortality in general, has

been falling throughout the whole twenty-six years. Until 1940 this decline was approximately balanced by an increasing neo-natal mortality, largely due to the experience of infants in the first week of life. Since 1940 neo-natal mortality has also been falling, although in the first week of life the fall has been only slight.

4. Throughout the period the infant mortality rate in Belfast County Borough has been higher than that in other urban districts taken as an aggregate; the rates observed for the latter have, in turn, been consistently higher than those recorded for the aggregate of rural districts.
5. Since 1940 the decline in infant mortality has been fastest in the County Borough of Belfast and slowest in the aggregate of rural districts.
6. An analysis of cause of death, as registered and tabulated, has been made, and, although conclusions based on the trends of such statistics are bound to be tentative, evidence does emerge that the registered causes of death associated with neo-natal mortality (e.g., premature birth, injury at birth, and congenital malformations) were responsible for an increasing mortality rate up to the beginning of the present decade. Since then a slow fall in mortality has occurred in these causes of death.
7. With the exception of the foregoing and of diarrhœea and enteritis, violence, and possibly pneumonia, a fairly steady decline in mortality from other causes has been observed. In some cases, e.g., diseases of the nervous system and possibly bronchitis, the decline has been more dramatic than in others.

Acknowledgements

I am indebted to Mr. W. A. Carson, the Registrar General for Northern Ireland, for a preview of the relevant figures now published in his Annual Report for 1947; to my colleague Mr. J. D. Merrett, for his assistance with the arithmetic; and to Mr. C. G. A. Bailie, for drawing the figures.

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